Question Bank
(UNIT – 3)

Serial No.	Questions	CO	Bloom's Taxonomy Level	Difficulty Level	Competitive Exam Question Y/N	Area	Topic	Unit
1	What is the cardinality of these sets: a) ϕ (b) $\{\phi\}$ (c) $\{\phi,\{\phi\}\}$ (d) $\{\phi,\{\phi\},\{\phi,\{\phi\}\}\}$	3	K2	Low	N		Sets	3
2	Find power set of X = {{ }, 1, {b} }	3					Sets	3
3	Write the elements of the set $P(P(P(\emptyset)))$ where $P(A)$ denotes the power set of the set A and $\emptyset$ denotes the empty set.	3					Sets	3
4.	Let $A_i=\{1,2,3,\ldots i\}$ for i=1,2,3,…. Find (a) $\bigcup_{i=1}^{n} A_i$ (b) $\bigcap_{i=1}^{n} A_i$	3					Sets	3
.5	Prove that $(\overline{A \cap B}) = \bar{A} \cup \bar{B}$ & $(A\ U\ B\ U\ C)' = A' \cap B' \cap C'$	3					Sets	3
6	Prove that (i) $A\times(B\cup C)=(A\times B)\bigcup(A\times C)$ (ii) $A-(B\cup C)=(A-B)\cap(A-C)$ iii) $A-(B\cap C)=(A-B)\cup(A-C)$	3					Sets	3
7	Define Multi- Sets with examples. Give the rules of finding Union, Intersection, & Differences.	3					Sets	3

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8	How many relations are there on a set with n elements?	3					Relation	3
9	How many reflexive relations are there on a set with n elements?	3					Relation	3
10	List the ordered pairs in the relation R from $A = \{0,1,2,3,4\}$ to $B = \{0,1,2,3\}$, where $(a,b) \epsilon R$ iff (a) $a = b$ (b) $a + b = 4$ (c) $a > b$ (d) $a \mid b$ (e) $gcd(a,b) = 1$ (f) $lcm(a,b) = 2$	3					Relation	3
11	Let R be the relation R={(a,b) | a<b} on the set of integers. Find (a) R^{-1} (b) $\bar{R}$	3					Relation	3
12	For each of these relations on the set {1,2,3,4}, decide whether it is reflexive, whether it is symmetric, whether it is anti-symmetric, and whether it is transitive. (a) {(2,2), (2,3), (2,4),(3,2), (3,3), (3,4)} (b) {(1,1),(1,2),(2,1),(2,2),(3,3),(4,4)} (c) {(2,4),(4,2)} (d) {(1,2),(2,3),(3,4)} (e) {(1,1),(2,2),(3,3),(4,4)}	3					Relation	3

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13	Let R={(1,2),(1,3),(2,3),(2,4),(3,1)} and S ={(2,1),(3,1),(3,2),(4,2)} be relations defined on{1,2,3,4}. Find SoR and RoS.	3					Relation	3
14	Let R1 and R2 be the “divides” and “is multiple of” relations on the set of all positive integers, respectively. That is, $R1 = \{(a, b): a\ divides\ b\}$ and $R2 = \{(a, b): a\ is\ a\ multiple\ of\ b\}$. Find (a) $R1\ U\ R2$ b) $R1 \cap R2$ c) $R1 - R2$ d) $R2 - R1$ e) $R1 \oplus R2$	3					Relation	3
15	Let $R1 = \{(a, b): a >= b\}$ and $R2 = \{(a, b): a <= b\}$. Find (a) $R1\ U\ R2$ b) $R1 \cap R2$ c) $R1 - R2$ d) $R2 - R1$ e) $R1 \oplus R2$	3					Relation	3
16	List the ordered pairs in the relations on {1,2,3} corresponding to these matrices (where the rows and columns correspond to the integers listed in increasing order). (a) $\begin{matrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{matrix}$ (b) $\begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{matrix}$ (c) $\begin{matrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{matrix}$	3					Relation	3
17	Let X = {1, 2, 3, 4} and R = {(x, y) : x > y} (a) Give the ordered pair of R (b) Draw the graph of R (c) Give the relation matrix of R	3					Relation	3

18	Let R be a relation on R, the set of real numbers such that $R = \{(x, y) : \lvert x - y \rvert < 1\}$. Is R an equivalence relation on R ?	3					Relation	3
19	For each of these relations on the set {1,2,3,4}, decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive. (a) {(2,2), (2,3), (2,4),(3,2), (3,3), (3,4)} (b) {(1,1),(1,2),(2,1),(2,2),(3,3),(4,4)} (c) {(2,4),(4,2)} (d) {(1,2),(2,3),(3,4)} (e) {(1,1),(2,2),(3,3),(4,4)}	3					Relation	3
20	Determine whether the relation R on the set of all web pages is reflexive, symmetric, antisymmetric, and/or transitive where $(a, b) \in R$ iff (a) Everyone who has visited Web page a has also visited Web page b. (b) There are no common links found on both Web page a and Web page b. (c)There is at least one common link on Web page a and Web page b. (d)There is a web page that includes links to both Web page a and Web page	3					Relation	3

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21	If R is an equivalence relation on a set A. Then show that R−1 is also an equivalence relation on set A.	3					Relation	3
22	If R is a relation on set A, then R is transitive iff $R^2 \subseteq$ R.	3					Relation	3
23	Let A be the set of all integers and a relation R is defined as R = {(x, y) : x ≡ y (mod m)}. Prove that R is an equivalence relation.	3					Relation	3
24	Let R be the following equivalence relation on the set A = {1,2,3,4,5,6}. R={(1,1),(1,5),(2,2,),(2,3)(2,6)(3,2),(3,3),(3,6),(4,4),(5,1),(5,5)(6,2),(6,3),(6,6)} Find the partition of A induced by R.	3					Relation	3
25	Let S={1,2,3,4,5,6}. Determine whether or not each of the following is a partition of S: a) P_1={{1,2,3},{1,4,5,6}] b) P_2= [{1,2},{3,5,6}] c) P_3=[{1,3,5},{2,4},{6}] d) P_4 =[{1,3,5},{2,4,6,7}]	3					Relation	3

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26	Give an example of a relation which is: (a) Reflexive and transitive but not symmetric (b) Symmetric and transitive but not reflexive (c) Reflexive and transitive but neither symmetric nor anti-symmetric (d) Reflexive and symmetric but transitive	3					Relation	3
27	Let X= {1,2,3,4}. Determine whether or not each relation below is a function from X into X: (a) f= {(2,3),(1,4),(2,1),(3,2),(4,4)} (b) g= {(3,1),(4,2),(1,1)}. (c) h= {(2,1),(3,4),(1,4),(2,1),(4,4)}	3					Function	3
28	Determine which of the following functions are bijection from R to R. a) f (x)= 2x+1 (b) f(x) = x2 +1	3					Function	3
29	Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. Find the composition of f and g. What is the composition of g and f?	3					Function	3

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30	Let $f: A \rightarrow B$ and $g: B \rightarrow C$ such that f and g are bijective functions, then show that gof is also bijective function from A to C and $(gof)^{-1} = f^{-1}og^{-1}$	3					Function	3
31	Let n denote a positive integer. Suppose a function L is defined recursively as follows: L(n) = $\begin{cases} 0 \ if \ n = 1 \\ L\left(\left\lfloor \frac{n}{2} \right\rfloor\right) + 1 \ if \ n > 1 \end{cases}$	3					Function	3
32	Define Size of a set.	3					Function	3
33	Show that the set of odd positive integers is a countable set.	3					Function	3
34	Show that the set of all integers is countable.	3					Function	3
35	Show that the set of positive rational numbers is countable.	3					Function	3
36	State Cantor’s diagonal theorem.	3					Function	3
37	Show that the set of real numbers is an uncountable set.	3					Function	3
38	State Schroeder-Bernstein theorem.	3					Function	3
39	Show that the|(0,1)|=| (0,1]|.						Function	3

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40	State Power Set theorem .Show that the cardinality of set is less than cardinality of its power set.	3					Function	3
41	Use mathematical induction to show that $1+2+2^2+\ldots+2^n=2^{n+1}-1$ for all nonnegative integers n.	3					Function	3
42	Show that the following result using mathematical induction: $f_0f_1 + f_1f_2 + f_2f_3+\text{---------}f_{2n-1}f_{2n} = f_{2n}^{\ 2}$ for all n>0,with $f_0=0,f_1=1$ where f_n is the nth Fibonacci number.	3					Function	3
43	Use mathematical induction to prove that $2^n<n!$ for every positive integer n with $n\geq 4$.	3					Function	3
44	For any $n \in Z^+$, show that $\sum_{i=1}^{n} i = 1+2+3+------+n = \frac{n(n+1)}{2}$.	3					Function	3
45	Prove by mathematical induction : $\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+\ldots\ldots+\frac{1}{(2n-1)(2n+1)}=\frac{1}{2n+1}$.	3					Function	3

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46	Among the 900 three-digit integers (100 to 999), where the integer is the same whether it is read from left to right or from right to left are called left, are called palindromes palindromes. Without actually determining all of these Without actually determining all of these three-digit palindromes, we would like to determine their sum.	3					Function	3
47	Show that for all $n \geq 14$,we can express n using only 3's and 8's as summands.	3					Function	3
48	State Fundamental theorem of Arithmetic.	3					Function	3
49	Find the prime factorizations of 100, 641, 999, and 1024.	3					Function	3
50	Show that 101 is prime.	3					Function	3
51	Find the prime factorization of 7007.	3					Function	3
52	What is the greatest common divisor of 24 and 36.	3					Function	3

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Date:

Signature of Course Coordinator/DC:

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